DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
WATER QUALITY MONITORING AND ASSESSMENT SECTION
WATERSHED INFORMATION SHEET

Fox, Wyaconda, Des Moines River Basin- 07110001, 07100009

Basin Description

The Fox, Wyaconda and Des Moines River basin lies in the northeastern corner of Missouri. The uppermost portions of the Wyaconda basin and the upper half of the Fox River basin lie in southeastern Iowa. The Des Moines is the largest interior river in Iowa and drains much of the central portion of that state. The lower 29 miles of the Des Moines forms the state line between Missouri and Iowa and there is a strip of land three to four miles in width along the river that comprises its watershed in Missouri. The Fox, Wyaconda and Des Moines all flow in a southeasterly direction to their confluence with the Mississippi River.

The largest tributaries within Missouri are the Little Fox and Little Wyaconda Rivers. The portion of the basin within Missouri is 858 square miles in area. The largest reservoir in the basin is Agate Lake with a surface area of 167 acres. Wyaconda Lake, which serves the town of Wyaconda, is the only public drinking water reservoir in the basin.

Average annual rainfall is 35 inches. Stream flow statistics for the basin are shown in Table 1.

Table 1. Stream Flow Statistics for the Fox, Wyaconda, and Des Moines River Basin

Stream/Location	Watershed Area (sq.mi.)	Period Of Record	Flow (cfs)				
			90th Percentile *	Mean	Median **	10th Percentile ***	7Q10 Low Flow+
Fox R. @ Wayland	400	1922-2004	540	264	38	2.4	0.0
Wyaconda R. nr Canton	393	1932-72 1979-2004	550	266	31	2.3	0.0

*Flow is less than this amount 90 percent of the time
**Flow is less than this amount 50 percent of the time
***Flow is less than this amount 10 percent of the time
+ The lowest average seven consecutive day flow that occurs with a recurrence interval of 10 years.
++ Record exists for most years in this interval

The Fox, Wyaconda and Des Moines River basin lies within the Dissected Till Plains physiographic province and is characterized by a mixture of hills and open plains. Basin-wide, 45 percent of the land is row crop, 37 percent is pasture and hay fields, 14 percent forest and 1 percent open water.

Except for areas in the lower portions of the basin where streams have incised Mississippian aged rock, the surface of the basin is glacial till overlain by loess. Glacial till is a mostly unsorted mixture of clay, sand, gravel and rock debris created and pushed southward into Missouri by the great glacial ice sheets. Loess is a windblown silt deposit. Depth of the till is highly variable but is generally less than 200 feet. Loess deposits are 4-8 feet in depth.

The presence of the clayey till and the underlying shale beds ensure that there is very little movement of water to the subsurface. Most water movement in the basin is through the surface stream network. Water that reaches the subsurface will resurface locally when a stream valley incises a confining aquatard (an impermeable layer). Since very little water infiltrates to the subsurface, streamflow can be very high during wet weather. For the same reason, base flows, streamflow sustained only by the re-emergence of groundwater into the stream, are very low during the intervening dry periods. There are only three small springs of note in the basin. None of these sustain flow in dry weather.

Water Quality Concerns

Acceptable water quality is defined by Missouri's Water Quality Standards [http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7a.pdf] . Streams or lakes that do not meet these standards are considered "impaired." They may not be fit for certain uses such as swimming, drinking water supply or protection of fish and other aquatic life. Waters are considered "affected" rather than "impaired" if water quality changes are less serious and state standards are not exceeded. These standards also list more than 3,600 classified streams and more than 400 classified lakes in the state. A classified stream is one that is either a permanently flowing stream or one that may stop flowing in dry weather but still maintains large pools of water that support aquatic life. Unclassified streams are the small tributaries to classified streams that typically have flowing water only during wet weather and are dry for the remainder of the year.

Water Quality in Prairie Streams
http://www.dnr.mo.gov/env/wpp/watersheds/info/wq-prairie-str.pdf

Aquatic Habitat in Prairie Streams
http://www.dnr.mo.gov/env/wpp/watersheds/info/aquatic-hab-prairie-str.pdf

Point Source Pollution

Point source pollution is a discharge of wastewater from a single location such as a wastewater treatment plant. Wastewater treatment plants can serve industries, small businesses, subdivisions, mobile home parks, apartment complexes, or entire cities. Wastewater from residential sources such as subdivisions, apartments and mobile home parks is often referred to as "domestic wastewater" and contains primarily treated human wastes, food wastes and detergents. The primary pollutants of concern in domestic

wastewater are the amount of organic matter, which is commonly reported as Biological Oxygen Demand (BOD), suspended solids, and ammonia. Industrial and commercial wastewater can be more complex and may contain, in addition to domestic wastes, heavy metals or man-made organic chemicals that can be potentially toxic. Discharges from most municipal wastewater treatment plants are usually a mixture of domestic and industrial/commercial wastewater. Most wastewater plant discharges are also typically high in nitrogen and phosphorus, two elements that act as fertilizers and can cause excessive algae growth in waters receiving these discharges.

There are 16 permitted domestic or industrial/commercial point sources that discharge a combined 0.76 million gallons per day (mgd) of treated wastewater into the waters of the Fox, Wyaconda, Des Moines River basin. There are 398.5 miles of classified streams in the basin, none of which are known to be affected or impaired by point source wastewater discharges. There are 0.3 miles of unclassified streams affected or impaired by point source wastewater discharges.

Wastewater Treatment
http://www.dnr.mo.gov/env/wpp/watersheds/info/wastewater-treatment.pdf

Nonpoint Source Pollution

Nonpoint source pollution occurs when pollutants are released from numerous points that are often spread out and difficult to identify and control. In the Fox, Wyaconda, and Des Moines Rivers and their tributaries, the most serious nonpoint problem is degradation of aquatic habitat. A total of 241 miles (60 percent) of classified streams in the basin are considered to have degraded aquatic habitat. The lack of infiltration of rainfall, when combined with local soil tillage and other land uses leads to a large amount of surface runoff during wet weather. This contributes to soil erosion and high levels of sediment deposition in streams. The quality of aquatic habitat is further impaired by removal of wooded riparian vegetation, and by the channelization, or straightening, of streams. Channelization has occurred in 77 miles (19 percent) of streams in the basin.

Storm water runoff in the Midwest can carry significant amounts of fertilizers, animal wastes, and pesticides into streams. The pesticide of greatest concern is Atrazine, a common agricultural herbicide used on corn and grain sorghum. Missouri's water quality standards allow no more than 3.0 ug/l Atrazine in drinking water reservoirs as a long-term average. Wyaconda New reservoir is the only reservoir in the basin that serves as a public drinking water supply source. The long-term average Atrazine level in the reservoir is 2.05 ug/l.

Drinking water reservoirs throughout northern and western Missouri are also monitored for several other common agricultural herbicides. Results of this monitoring over many years indicate that the only other herbicide that may be a human health concern in drinking water reservoirs is Cyanazine. The Federal Health Advisory Level of Cyanazine

in drinking water reservoirs is 1 ug/l as a long term average. Cyanazine has not been found in the Wyaconda Reservoir and Federal regulations require the end of all Cyanazine use in 2002.

Finished drinking water is monitored regularly at all public supplies. Finished drinking water in Missouri has been found to meet state standards for pesticides. Levels of Atrazine and other herbicides in finished drinking water supplies may be significantly lower than the amounts found in the reservoirs if the drinking water plants take measures to reduce herbicides during the water treatment process.

Many private residences use groundwater as a drinking water supply. Studies of private well water quality in northeastern Missouri have shown that about 20 percent of all private wells sampled exceeded drinking water standards for nitrate. And 1-2 percent of wells exceeded drinking water standards or health advisory levels for pesticides, most commonly the herbicides Atrazine or Alachlor. This contamination is often caused by local land use practices or surface contamination of the wellhead and does not represent widespread contamination of the underground aquifer. Deeper aquifers are protected from surface contamination by impermeable strata.

During warm weather, when stream flows are low, livestock tend to gather together in and around streams. The wastes they leave behind in the water contribute to nuisance algae growths, low levels of dissolved oxygen and elevated levels of ammonia and bacteria.

Water Quality Management

The department achieves water quality management of point source pollutants through the issuance and enforcement of wastewater discharge permits. These permits limit the amount of pollutants that can be discharged. All point source wastewater discharges must obtain a permit and adhere to its discharge limitations. All permits require at least a level of treatment equal to national wastewater treatment standards. In situations where these national treatment standards are not adequate to protect the streams or lakes receiving these wastewater discharges, stricter permit limits that do protect these waters are required. The permits require regular monitoring and reporting of discharge quality. The department also conducts regular inspection of wastewater treatment facilities and receiving waters.

Nonpoint source pollution is addressed through the state's nonpoint source management plan. This plan is a cooperative program between the Department of Natural Resources and other federal, state and local government agencies or organizations, local landowners and other interested citizens. The plan emphasizes addressing problems at the watershed level through the use of management practices that control nonpoint pollution. The most commonly supported practices are those that control soil erosion on agricultural and urban lands, improve quality and quantity of forage on grazing lands, protect riparian zones, and those that control runoff of animal

manure, fertilizers and pesticides. The state nonpoint source management plan is a voluntary program that provides funds to help defray the cost of adopting management practices.

Since 1990, there have been three nonpoint source watershed projects in the basin. Two projects were funded by state sales tax funds set aside for soil and water conservation. The third project used federal Section 319 funds to address hydrology and riparian problems along Fox River.

Table 3. Nonpoint Source Watershed Projects in the Fox, Wyaconda, and Des Moines River Basin

Watershed Name	County	Project Date	Watershed Size (Acres)	Acres Treated	Percent of Watershed Treated
Dumas Creek	Clark	1991-95	7,652	4,013	52%
Fox R. Ecosystem	Clark	2003-06			
Little Fox Creek	Scotland	2002-2009			

The Missouri Department of Natural Resources monitors water chemistry and aquatic invertebrate communities at many locations in Missouri. The department also tracks the quality of domestic, industrial and storm water discharges. These monitoring activities provide information on water quality problems, such as their specific location, pollutants, sources and possible solutions. This information guides the management activities the department takes to protect water quality in Missouri.

Web links

US Geological Survey http://mo.water.usgs.gov/

Kansas City District Corps of Engineers http://www.mvs.usace.army.mil/

Missouri Department of Conservation

http://www.mdc.mo.gov/fish/watershed/fox/contents/120cotxt.htm

US Environmental Protection Agency http://www.epa.gov/region7/water/index.htm